

## *The Value Proposition of Operationalizing Critical Infrastructure Resilience*

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*"Resilience starts with regaining control of your essential functions... and if you shut down physically or economically, the enemy [or disaster] wins."  
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How well have we improved hazard mitigation in the past 10 years? At last year's conference Johns Hopkins summarized key findings of a study, "Beyond the Storms," designed to identify the major themes of regional preparedness and community resilience in the face of inevitable disasters. This discussion paper builds on that research with new steps to operationalize resilience at key locations in the country, and quantify the economic impact that will incentivize public and private sector investments. If foreign diplomacy, force projection, commercial trade and national security begin at home, how do we begin to put our house in order (Haass, 2013)? The premise of this paper is that our basic security and safety starts with a strong domestic economy—the *sine qua non* of our society and way of life—and the essential ligaments of our economy are linked directly to the active virtue of critical infrastructure resilience (Egli 2014).

Consider the following sample of events and facts along with the objectives of regional preparedness and economic stability in the security "commons." And ask how fragile, how interconnected, and how globalized critical infrastructure systems are, and how one might quantify the economics of resilience in the face of these disruptive exemplars?

- The Metcalf power station near San Jose, California, near Silicon Valley, was attacked (April 2013) by unknown operatives who targeted high-voltage generation and transmission capabilities and seriously threatened power disruption in a vital economic area;
- The majority of oil entering the Gulf of Mexico region of the United States enters through the Louisiana Offshore Oil Platform (LOOP) and the Port of Houston; similarly the Hawaiian Islands depend on the flow of fuel through a Single Point Mooring off the coast of Honolulu;
- In Spring '14 destructive twisters and tornadoes are touching down in Mississippi, Arkansas, and Oklahoma, leaving homes and communities stranded without transportation, power, and basic services;
- National Weather Service predictions of a strong El Nino weather system in the summer and fall of '14 highlights the interconnected nature of the global supply chain because severe weather impacts precious metal mining and subsequent prices (Ex: nickel is needed for strengthening steel);
- The power generation stations in some parts of the country must be manned during Sunday NFL football games to adjust the electric load during TV commercials—when fans watching games simultaneously rush to refrigerators during a commercial and open the door—due to a surging loads on electrical systems;
- In March '14, an oil spill (estimated 170,000 gallons) in the Galveston Bay impeded the 25-mile Houston ship channel, threatened wildlife, and stalled the movement of vital shipping in and out of the port (estimated 80 commercial ships), adversely impacting the flow of oil and commodities from a major intermodal and economic hub of domestic and international trade;
- In April '14, a 15 year-old teenager stowaway hides in the wheel well of a Hawaiian Airlines Boeing 767 jetliner during a flight from California to Hawaii, revealing vulnerabilities in multi-million dollar sensor and high-technology security systems;
- Regional water distribution networks, farmers, cattle ranchers, agriculture systems, and food suppliers are struggling as 60% of the Western United States faces historic levels of sustained drought conditions;
- Power generation stations—that provide electric power to drive critical infrastructure and key resources—experience thousands of cyber-attacks every day;
- Active shooters and domestic terrorists like those at Fort Hood, Aurora, Colorado, and the Boston Marathon highlight a vexing security challenge inside our borders and reveals an emerging trend of homeland threats.

There are certain to be more disasters in 2014—extreme weather, disruptive events, acts of violence, health pandemics—that require new innovations, new thinking, and new investments. In 2013, there were 296 natural disasters globally yielding economic losses of \$192 billion, with the U.S. accounting for 45 percent of all insured losses. This year began with a polar vortex, sending much of the U.S. into record-breaking low temperatures and revealing vulnerabilities in our power, fuel, and transportation infrastructures. We know that infrastructures are the backbone of our economy, security, and health because they provide the power for our homes, the water we drink, transportation that moves us, and the communications systems we rely upon to maintain contact with family and businesses. But how well do we understand their vital interdependencies and nexus to our economy?

Mapping of economic, virtual, and physical interdependencies and conducting systematic analyses of strategic locations will provide a new level of understanding and efficacy to implement resilience. But we must move beyond the promulgation of strategies and policy guidance to help individuals, communities, regions and states better understand the value proposition of resilience *implementation*. We must present actionable and practical ways to make our critical infrastructures more adaptable in the face of future crises. However, resilience will only gain support and essential funding if it can be implemented in cost-effective and efficient ways across the private and public sectors, and if decision makers and investors understand the financial implications.

The greatest need in advancing the implementation of preparedness is to define the value proposition and return on investment (ROI) for both the public and private sectors to incentivize a commitment to operationalize community and regional resilience. Owners and

operators, researchers, planners, and emergency managers often struggle to quantify and communicate in measurable terms the impact of resilience so that the public and private sectors understand that preparedness is a *public good*. This approach suggests that we must all invest in resilient actions because we have shared interests that transcend our utilitarian tendencies, urging collective action rather than face a *tragedy of the commons* in homeland security (Ostrom 1990).

Data sources are available now—as one can see in major ports and economic hubs such as New York City, Baltimore, Los Angeles, Houston, Seattle, and Honolulu—to help analyze, quantify, and monetize this issue with a holistic, integrated, all-hazards approach that fosters public-private partnerships. For example, at the core of our economy, some 50% of our workforce is comprised of small/medium sized businesses where they support critical infrastructures and feed over 18,000 large businesses—the essential arteries of our national economy. This spotlights the need for business continuity, hazard mitigation, and catastrophic risk management by understanding interdependent critical infrastructures and acting anew upon resiliency initiatives.

In the face of increasing natural and man-made stressors on our economy and infrastructure systems, there is a growing imperative to understand and map the specific linkages among physical and virtual systems. This mapping process will inform computational analyses and modeling to support optimized decision-making in a resource-scarce environment—allowing decision makers and owners/operators to prioritize actions in a way that delivers measurable return on investments in the public and private sectors.

Egli, Dane. 2014. *Beyond the Storms: Strengthening Homeland Security and Disaster Management to Achieve Resilience*. London, England: ME Sharpe.

Haass, Richard. 2013. *Foreign Policy Begins at Home: The Case for Putting America's House in Order*. New York, NY: Basic Books

Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.